105 17834

Standard Radio

FIELD TEST SET, TYPE QA.8

Standard Telephones and Cables Limited

Standard Telephones and Cables Limited

RADIO DIVISION

TELEPHONE: ENTERPRISE 1234
TELEGRAMS: ESSTEECEE, TELEX, LONDON
CABLEGRAMS: RELAY, LONDON

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OVERSEAS BRANCHES
CAIRO, COLOMBO, DUBLIN,
JOHANNESBURG, KARACHI,
NEW DELHI, SALISBURY.

16th August, 1960.

Ministry of Aviation,
Flying Unit,
Stansted.
Essex.

Dear Sirs,

FIELD TEST SET TYPE QA8

Enclosed herewith you will find a brief technical description of the above Field Test Set which we are quite sure will be of the greatest interest to you as aircraft operators. It provides for testing the following equipments:

1. V.H.F. Communications Receivers

   Checks each 50 Kc/s spaced channel in the band 118 - 135.95 Mc/s (360 channels.)

2. V.H.F. Transmitters

   Checks the R.F. power output of each 50 Kc/s spaced channel in the band 118 - 135,95 Mc/s (360 channels)

3. I.L.S. Localiser Receivers

   Checks any 50 Kc/s spaced channel that may be allocated to I.L.S. in the band 108 - 117,95 Mc/s. (200 channels)

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4. I.L.S. Glide Slope Receivers

Checks each 300 Kc/s spaced channel in the band 329,3 - 335 Mc/s (20 channels)

5. V.O.R. Navigation Receivers

Checks any 50 Kc/s spaced channel that may be allocated to V.O.R. in the band 108 - 117,95 Mc/s.

6. 75 Mc/s Marker Receivers

Checks lamp and audio operation at 400, 1300 and 3,000 c/s.

The test signals may be radiated by an aerial or injected into the equipment under test by direct connection via a coaxial cable. This means that the QA8, whilst essentially a field or ramp test set, may also be used in a radio workshop as a general purpose generator for fault finding.

In the interests of reliability, weight saving etc., valves have been dispensed with entirely and the test set requires connection only to a 28 volts D.C. supply to operate it.

From the foregoing you will see that the QA8 is the most comprehensive Field Test Set yet to be produced and we are quite sure will enable you to considerably reduce aircraft turn around times when radio checks are called for.

The QA8 will be exhibited on our stand at the forthcoming Farnborough Air Show (Stand No.148) and our engineers will be in attendance to answer any technical questions you may have.

The QA8 is only one of a new generation of test equipments we are now marketing. Other equipments to be exhibited for the first time at Farnborough are:-

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QP.3 Bearing Calibrator
QB.5 S.W.R. Bridge
QB.6 Tuning Indicator
QA.9 I.L.S./V.O.R. Tone Generator.
QA.10 Radio Altimeter Test Set.

We look forward to seeing you at Farnborough but if you are unable to attend and would like information on the above test sets please do not hesitate toadvise us.

Yours faithfully,
STANDARD TELEPHONES AND CABLES LIMITED.

C. E. Strong

C. E. STRONG,
Manager - Radio Division.

los 17834

QA8 V.H.F. COMMUNICATIONS, I.L.S. AND V.O.R.

FIELD TEST SET.

P.T.O.

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STANDARD TELEPHONES AND CABLES LTD.
101-LRE-28A
ILS/VOR/COMMUNICATION TEST SET
TYPE QA8
Modulation Selector
400 c/s
1300 c/s
V.O.R.
3000 c/s
Loc./GlideSlope
Off
Mc/s Selector
50 Kc/s Selector
131 · 15
Loc./G.S.Deviations
Centre
3 Dots Left/Up
3 Dots Right/Down
Stepped Deviations
V.O.R.Bearings
180°
135°
225°
90°
270°
45°
315°
0°
0°
Stepped Bearings
Glide Slope
Marker
Comm. Localiser V.O.R.
R.F.Selector
Carrier Level
Modulation Depth
Stabilised Volts
Transmitter Power
Supply Volts
Off
RF Output
Meter Selector
PhoneJack
Maximum Output
R.F.Attenuator
Battery Input
dB
0
dB
90 c/s Increase
Variable Deviations
-5°
0
5°
-10°
10°
-15°
15°
-20°
20°
-25°
25°
Add to AboveBearing
Off
1 Amp Fuse
On Battery
1 Amp Fuse
Transmitter Load Input

QA8 FIELD TEST SET.

1. GENERAL.

The QA8 is a completely transistorised field or 'ramp' test set which provides checking facilities on the 581 channels associated with V.H.F. Communication and Navigation equipment fitted in aircraft. It is especially intended for pre-flight checks and trouble shooting during short turn around periods.

The test set may be used in two ways, which are as follows:-

(a) By radiating signals to the aircraft. This eliminates the need to interfere with the installation, thus allowing a quick serviceability check.

(b) By injecting signals direct into the receivers via a built-in calibrated attenuator and coaxial line.

This latter facility allows a check with the aerial system isolated and additionally permits the QA8 to be used in a radio workshop as a general purpose generator for fault finding. It is emphasised though that it should not be used for adjusting "course" controls on Navigation equipments. The R.F. output is approximately 200 millivolts and the attenuator will reduce this to about 10 $/^{u}$V.

The QA8 will radiate appropriately modulated signals for functionally checking the following equipments:-

(1) V.H.F. Communications Receivers.

Checks each 50 kc/s spaced channel in the band 118 - 135,95 mc/s (360 channels).

(2) I.L.S. Localizer Receivers.

Checks any channel that may be allocated to I.L.S. in the band 108 - 117,95 mc/s.

(3) I.L.S. Glide Slope Receivers.

Checks each 300 kc/s spaced channel in the band 329,3 - 335 mc/s (20 channels).

N.B. For I.L.S. checking, Localizer and Glide Slope "off course" deviation is provided as a switched "3 dot" deflection, or as a continuously variable parameter. The "on course" accuracy is better than $\frac{1}{2}$ dot.

P.T.O.

(4) V.O.R. Navigation Receiver checking.

Checks any channel that may be allocated for V.O.R. in the band 108 - 117,95 mc/s.

N.B. When checking V.O.R. Receiver, 8 spot bearings are available with an accuracy of 2°. Additionally, it is possible to "fill in" between the 45° points as an incremental phase control is provided. This allows any specific bearing to be obtained and is especially useful for examining suspected instrumentation where lack of torque has been reported.

(5) 75 mc/s Marker Receivers.

Will check lamp and audio operation at 400, 1 300 and 3 000 c/s.

(6) V.H.F. Transmitter.

Will give an indication of R.F. power output to a maximum of 30 watts.

The test set is portable, the dimensions being $17\frac{3}{4}$ in. x $13\frac{1}{2}$ in. x $10\frac{1}{2}$ in. and weighs only 30 lb. Stowage space is provided for the cables and a cover is provided to guard the front panel from moisture or damage. It operates from a 22,5 - 33 volts D.C. power supply and the current drain is 300 mA. As already stated, transistors are used throughout and as a measure of precaution protection is provided against transient surges of up to 80 V and 100 milliseconds duration.

On the front panel are mounted the following main controls:-

(1) R.F. Selector Control.

Provides for selecting the required operating frequency for checking all Communications, Localizer, Glide Slope, V.O.R. and Marker Receivers. The frequency selected is viewed through a window which is illuminated for night use.

(2) Modulation Selector Control.

Provides for selecting the appropriate modulation tone for checking Communications, Localizer, Glide Slope, V.O.R. and Marker Receivers. Includes a modulation "off" position.

(3) Localizer/Glide Slope Deviation Control.

Allows selection of "3 dots left/up" or "3 dots right/down" and "on course" signals for checking I.L.S. receivers.

(4) I.L.S. Tone Attenuator Control.

Provides a continuous variation of the ratio of 90 to 150 c/s I.L.S. tones. Supplements (3) above.

(5) V.O.R. Bearing Selector.

Allows the selection of any one of eight 45° bearings for checking V.O.R. receivers.

(6) Incremental Bearing Selector.

Supplements (5) above by adding or subtracting up to 25° to or from the selected 45° points.

(7) Meter and Meter Switch.

The meter scale is engraved to provide information on supply volts, stabilised volts, carrier level, modulation depth and transmitter R.F. output power. The switch selects the required indication and includes an off position.

(8) R.F. Attenuator.

Allows the R.F. output to be reduced from a maximum of about 200 mV to approximately 10 μV.

A supply "on/off" switch and a 'phone jack for monitoring "side tone" are also included.

2. BRIEF TECHNICAL DESCRIPTION.

Frequency Generation.

560 channels spaced at 50 kc/s intervals are available for checking V.H.F., V.O.R., and I.L.S. Localizer equipments and 20 channels spaced at 300 kc/s for checking I.L.S. Glide Slope receivers. All of these channels are derived from 29 high stability, wide temperature band, crystals which control 3 transistor oscillators. The oscillators are followed by a chain of mixers, doublers and amplifiers to achieve the final required frequency.

The 1st switched crystal controlled oscillator divides the band 108 - 135,95 mc/s into two equal parts and each part is again divided into fourteen 1 mc/s steps by a 2nd common oscillator controlled by 14 crystals. The 1st oscillator has actually a choice of 4 crystals, two for each half band so that in conjunction with these the decimal selection of the twenty 50 kc/s steps needs only ten crystals in the 3rd oscillator.

To obtain the Glide Slope channels in the band 329 - 335 mc/s, a separate oscillator, doubler, amplifier chain, controlled by a 100 mc/s crystal is provided. The output from this is combined with the output from the Communication channels over the band 129 - 135 thus producing the required Glide Slope frequencies.

It is necessary to ensure that the modulation depth of all channels, and especially those used for navigation equipment checking, is held within close limits. To ensure that this condition is achieved an automatic drive control circuit is used to regulate the drive to the modulated R.F. transistor thus stabilising the output stage and ensuring constant modulation depth on all channels. This is further helped by stabilising the supplies to the R.F. transistor collectors and modulators. Filters have been incorporated in the R.F. amplifier chains to eliminate unwanted harmonics, thus reducing spurious radiations and stabilising the operation of modulated stages.

The 75 mc/s Marker signal is derived from a separate crystal-controlled oscillator, the output of which is amplified and modulated. The automatic drive circuit previously mentioned also serves to provide a measure of regulation of the output stage.

Tone Generating Circuits.

The 30, 90 and 150 c/s tones are each generated by separate, specially stabilised, transistor oscillators and the frequency of each is determined by "Twin T" resistance capacity networks with a stability of 0,2%.

A high degree of negative feedback is used to ensure distortionless output and the amplitudes are stabilised against Zener diodes, a common one being used for the 90 and 150 c/s oscillators to ensure good course stability. The resultant amplitude and frequency stability is better than 1%. The 90 and 150 c/s outputs are fed to either stepped or sliding differential attenuators, the selection of which is controlled by a switch. The former attenuator provides an "on course" or three dots right or left deviation whilst the latter provides continuously variable deflections. From the attenuator the tones are fed to the modulator when on Localizer or Glide Slope channels.

The 30 c/s V.O.R. oscillator is used to frequency modulate the 9960 c/s oscillator. This latter oscillator is frequency stabilised to hold it close to its nominal frequency. The resultant frequency modulated tone is fed to the modulator when the modulation selector switch is in the V.O.R. position thus providing the "reference" component of a V.O.R. signal.

The "variable phase" component is produced by taking a 30 c/s signal which is in phase with the frequency modulation and feeding it to the phase shifting circuits which are controlled by the bearing selector switches mounted on the front panel. Eight 45° bearings are available and these are obtained by the use of one high stability resistor and capacitor in conjunction with a switched transistor phase splitter. This is capable of producing the eight bearings to an accuracy of 1°.

Intermediate bearings, i.e. between the 45° points, are produced by switching into circuit an incremental phase shifter in series with the 30 c/s amplifier. This allows continuous bearing variation between any of the eight points which is extremely useful for examining the response of flight instruments or airborne receivers to small changes

of bearing. Selection of either of these conditions is controlled by a switch mounted on the front panel.

The 400, 1300 and 3000 c/s Marker receiver tones for checking lamp and audio operation are produced by a simple transistor oscillator. The frequency stability is of the order of 2%. In addition to providing Marker channel modulation either of these tones can be switched for modulating the Communication channels and also for checking the audio stages on V.O.R.

All R.F. outputs are brought to a coaxial connector mounted on the front panel. To this may be connected either an aerial for checking under "radiation" conditions or a coaxial cable for direct signal injection to receivers (See 1, General).

R.F. transmitter output power is measured by a built-in calibrated load and the power is indicated on the general purpose meter. R.F. outputs of up to 30 watts can be checked with acceptable accuracy. A coaxial connector on the front panel allows the connection of the transmitter being checked.

Power Supply.

The QA8 has a built-in transistorised power supply which operates from a nominal 28 volts D.C. source. It can be operated over the range 22,5 - 33 volts but these limits must not be exceeded.

The current drain at 28 volts is approximately 300 mA which is sufficiently low to allow its operation from suitable dry batteries if necessary.

The power unit is protected against supply line surges of up to 80 volts and a duration of 100 milliseconds. No damage will result if the polarity of the connections to the 28 volts source is inadvertently reversed.

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